White Island: The microbial ecology of a sulfur rich hydrothermal system

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Biological and geological evidence exists to support the theory that life arose within hydrothermal environment. In addition, it is postulated that sulfate reduction may have been one of the first biochemical pathways to evolve within such a system. White Island (*Whakaari*) is New Zealand's most active volcano. It is a sulfur-rich environment with an extensive hydrothermal system, the surface waters of which are extremely acidic. White Island can therefore be considered an analogue for early terrestrial ecosystems that supported sulfur-metabolizing microorganisms.

Culture-independent techniques were used to determine the microbial diversity of the White Island hydrothermal environment. Twenty samples were collected from areas with a range of temperatures (36°C to 104°C) and acidity (pH 0.0 to 3.4). These samples were first analysed microscopically and then subjected to genomic DNA extraction. An SSU rRNA *E. coli* library was constructed using generic Bacterial and Archaeal PCR primers, and the SSU rRNA genes of selected ribotypes were sequenced. Geochemical analysis was carried out on surface waters collected from the island.

Numerous extremophilic microorganisms were identified including several archaeal species. This is the first report of this domain of life on White Island. Many of the microbes discovered in this study are thermophilic sulfur-metabolising acidophiles; examples include *Acidithiobacillus caldus* (Bacteria) and *Thermoplasma acidophilum* (Archaea). Identification of the microbes present in this hydrothermal system and the elucidation of their interactions with each other and with their environment will provide insights into the geomicrobiology of sulfur cycling and may contribute to an improved understanding of the origin and evolution of life.